

Platforms to Support e-Learning in Higher Education Institutions

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¹Abstract. Information and Communication Technology (ICT) have created new spaces in the construction of knowledge. Now, teaching goes beyond the institutions themselves and it arrives at businesses, our homes and social venues. The time for learning is no longer confined to a certain place and period of time, but the whole space, at any time, concepts, distance education, e-learning, collaborative work, b-Learning, m-Learning and Web 2.0 have all become increasingly important in higher education and educational communities. Using an action research methodology as qualitative research method, we present a case of a platform implementation to support e-Learning in the School of Technology and Management, Polytechnic Institute of Viana do Castelo, Portugal. Once the problem to be addressed was diagnosed, we present the action: a study on e-learning, and an analysis of the characteristics of the platforms to support a range of e-learning in Higher Education Institutions (HEIs). Based on this study, we developed a portal and this paper presents the phases of development and selection of tools and content, concluding with an evaluation of user satisfaction with this platform, and its importance for the development of e-learning in HEIs.

Keywords: DL, e-Learning, Web 2.0, LMS, CMS.

1. Introduction

Distance learning (DL) is an educational model which provides learning without limits of space or time, where the educational scenario assumes the existence of a temporal or geographic separation between teacher and students, and the use of technology becomes a tool for communication and broadcasting (except in correspondence courses). It is essentially the control of the learning process by the student [1]

The definitions presented in this study point to the fact that there is a transformation of the traditional teacher/student roles in the classroom, as well as changes in the wider role of the teacher, in the use of technology as an interface in the process, and in the geographical spread and number of students. The use of the Internet came to promote greater student-teacher and student-student interaction since, according to Moore and Kearsley[2] DL is not a new phenomenon; rather it is a way of teaching and learning individually, and has been so for more than one hundred years.

It is possible to identify stages in the evolution of distance education. The first generation is characterized by correspondence-based education, where teacher and student training materials were exchanged through the post. With the advent of audiovisual resources (educational TV, videos and tapes), DL enters its second phase, enabling alternative ways of learning for students as, in addition to reading, students could hear and see images associated to the educational content, allowing the teaching and learning process to be adapted to the different learning styles of students. The introduction of the Internet heralded a third phase for distance education, opening new spaces for learning and enabling synchronous and asynchronous communication between teacher and student, as well as between peers. At this stage, the use of email and chat tools grew swiftly. The fourth generation is marked by an almost complete replacement of written material (books and paper handouts) by digital multimedia material which can be easily accessed through teaching-learning environments and platforms. In this fourth and final phase, the process of teaching

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and learning is mediated by technology and so new names are created to refer to this new reality, such as 'e-learning', 'online learning', 'online training' or 'online education' [3], [4], [5]. E-Learning courses are based on the concept of 'studying anywhere, anytime'. However, traditional distance courses pre-defined "study time", as opposed to time devoted to other activities. In Web 2.0, the difference between studying and other activities seems to blur and disappear [6].

We are now familiar with e-learning as an innovative methodology and we have also seen that distance education presents itself increasingly as an alternative to classroom teaching, with the technological support associated with the dynamics of e-Learning [7]. Many of the authors who address these issues almost always come to the same conclusion: these methods, which are associated with ICT², offer new pedagogical possibilities and lead to differentiated content and working methods.

The lack of vision in planning for e-Learning and Distance Education in Higher Education Institutions (HEIs) led to the misuse of the term 'blended learning' or 'b-Learning'³, a method which is being implemented in spite of the resistance encountered, and which will be an improved method in the near future and will hold for many years. It is not so strange that Rikke Schultz and Lone Guldbrant Tonnesen [8] are concerned that resistance to the concepts of e-learning - including Distance Education - from teachers and students is due to four main factors in the tradition of adult education: curriculum tradition, oral tradition, lack of confidence in technical solutions to educational issues, and lack of experience with tools. The development of e-learning and DL requires the acceptance of tools, which is rare in educational institutions; therefore, teachers should be encouraged to use these tools and develop ways to integrate ICT pedagogically [8]. To address this gap, it would be appropriate to use professionals qualified in information systems and to platforms which support e-learning, as proposed in this project.

2. Case Study

Information and communication technologies (ICTs) have created new spaces in the construction of knowledge. Each day, more people are studying at home and, from there, can access cyberspace training and DL. The time for learning is no longer confined to a certain place and period of time; therefore, the concepts of distance education, e-learning, collaborative work, b-Learning, m-Learning and Web 2.0 have become increasingly important in higher education and other educational communities, although their development requires encouragement and training in the use of these tools. This article presents a case study of an implementation of a platform to support e-Learning in the School of Technology and Management of the Polytechnic Institute of Viana do Castelo, Portugal.

2.1. Research Methodology

The research methodology used in this project was action-research, similar to that proposed by Olesen and Myers[9]. In their work, these researchers successfully used an action research methodology to investigate the relationship between the introduction of electronic tools (groupware) in an organization and the consequent changes in individuals in terms of work habits and organizational structure. These authors give special attention to this methodology because it "allows a researcher to intervene in the organization and generate knowledge about the processes." (p. 321). Moreover, research presented by these authors allows for an interpretive analysis of the scenario or environment which enabled them to intervene to focus their research on how people try to act in order to achieve a specific situation. Olesen and Myers [9], employ a cycle of action research involving the following steps:

- Diagnostic: identifying the cause of the research;
- Action Planning: determining the actions to be taken to resolve the research problem;
- Actions taken: conducting and monitoring the planned actions;

²**ICT- Information and Communication Technology** – this corresponds to all of the technologies that influence and mediate the processes of information and communication. It can be understood as a set of integrated technological resources provided by means of the functions of hardware, software and telecommunications, automation and communication processes, scientific research and teaching and learning.

³**b-learning or blended learning** – this term derives from 'e-Learning', and refers to a training system where most of the content is delivered through a distance medium, usually over the Internet, but which also includes face-to-face situations, hence the origin of the name blended.

- Evaluation: determining if the actions addressed the research issue;
- Learning obtained: documenting the knowledge gained through the project.

2.2. Development Stages

2.2.1. Diagnostic

Motivated by the new generation of e-learning and the need to create individual learning environments based on the recently available Web 2.0 tools, this research intends to examine the importance of the implementation of a portal to support e-learning in the use of an e-Learning platform and Web 2.0 tools both at the administration level or at the user level, and to find out how relevant these are to the educational community. Taking as points of comparison the best practices already adopted by other institutions with a lesser or greater degree of maturity, and which somehow underpin the need for such applications, the interest in implementing this platform to support e-learning also resulted from the authors' experience as users and administrators of the Moodle platform of their institution to improve the practice of e-learning within the educational community.

2.2.2. Planning

Once the objective of the project was identified, a study was conducted into e-learning and new challenges in order to ascertain the quality of e-learning and make an analysis of the characteristics of platforms used to support e-learning at several HEIs.

The aim is to develop a platform to support e-Learning that is reliable and of quality in relation to the technology, processes and content. For this reason and, according to the Institute for Higher Education Policy [10] the "benchmarks" for the success of distance education can be organized into the following categories:

- Institutional Support – The standards in this category include activities to ensure a suitable environment for quality distance education and the policies that guide the development of education over the Internet. These standards relate to such matters as technical infrastructure, technology plans, and professional incentives.
- Development of courses - This category includes items related to development (including analysis, planning, implementation, testing, evaluation, maintenance, and so on).
- Teaching and Learning Process – It relates the didactic aspects.
- Structure of courses – This establishes policies and procedures which support the teaching-learning process and include the definition of the objectives of the course, availability of library resources, types of materials available to students, response time to students and assessment of students' expectations.
- Student Support - This category includes a range of services offered in support of student activities, such as training and assistance in using online resources.
- Teacher Support - Items in this category refer to some assistance and support activities provided by other more experienced members, or third parties.
- Evaluation and Auditing - The items in this category are policies and procedures which define how to evaluate quality.

Of the above-mentioned "benchmarks", those which seemed relevant to the development of a portal to support e-learning quality would be institutional support, support for students and teachers, not forgetting the aspects linked to technical development itself. The total freedom of current publication requires web-site authors to know who potential users are, advising on perception, design, navigation, usability, among others. The ISO/IEC 9126 for software quality fits the model of the 9000 family of quality standards. The quality of use lies in measuring the quality of the product in the specific context of each user. The quality of a software system can be understood in different ways and using different approaches, providing a quality model that incorporates six features, each with sub-features:

- Functionality – site capacity to provide functions that meet the needs of the user (active links, search engine internal contact with responsiveness, real-time communication, activities, collaborative writing).

- Reliability – capacity of the site to have a good level of performance (fault tolerance, maturity, compliance).
- Usability – capacity of the site to be understood, learned, attractive and usable by all users.
- Efficiency – site capacity to provide appropriate performance (Rapid Response).
- Maintenance – capacity of the site to be modified to include both improvements and extensions of features, and repairs to defects.
- Portability - capacity of the site to be transferred from one environment to another.

Therefore, in this study a portal with quality to support e-learning is considered to be able to meet the following Critical Success Factors (CSFs): environment, incentives given to the project, platform development, support and interaction, and evaluation. Based on the categories mentioned above, a questionnaire was created and applied to the leaders of platforms which support e-Learning in various HEIs[11], [12], [13], [14], [15], in order to obtain guidelines and guarantees for the correct implementation of the technology, processes, content and issues related with its use.

The tool used to formulate the questionnaire and analyze the responses given by the implementation teams of platforms to support e-learning in HEIs gave rise to an adaptation proposed by Tabora Silva [16] (Figure 1).

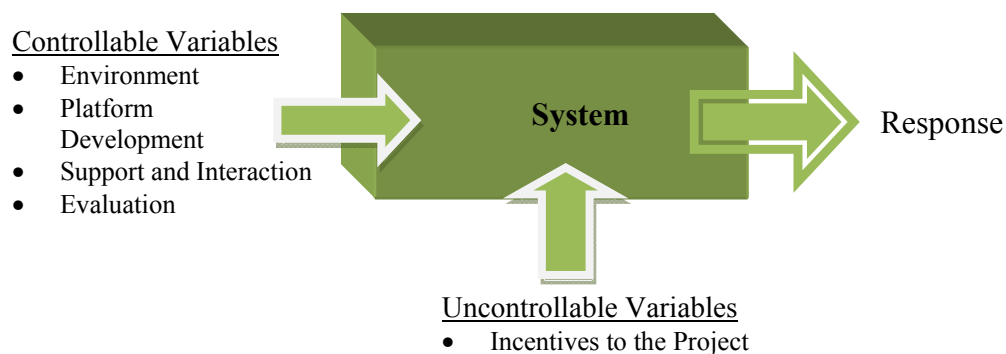


Figure 1 – Adapted Model (Taborda Silva, 2001)

In the model we have differentiated and defined two types of variables: i) dependent, which one aims to study and which depends directly on ii) the independent variable, which integrates a number of manageable and controllable factors and conditions that one wants to study. In the awareness that the type of information that had to be collected, and considering that the dependent variable "presence and quality of the platforms to support e-learning" is the presence of the standards of quality mentioned above, what follows is the identification and description of the independent variables:

I.V.1 – Environment

This variable concerns in many respects the relationship between the platform and the community, and what procedures are followed in choosing the solution, themes and dissemination of user feedback.

I.V.2 – Incentives to the Project

This variable has to do with how open the institution is to financially supporting the implementation of the platform to support e-learning, and incentives given to the team in the development of the application.

I.V.3 – Platform Development

This variable concerns the implementation of the platform and the enforcement of quality standards related to the technological development and application of the support services necessary for the community, as well as the frequency of procedures and the need for a multidisciplinary team responsible for the platform.

I.V.4 – Support and Interaction

This variable is related to the chosen forms of interaction with the school community. It also refers to the need for specific forms of technical assistance provided to those interested in using the platform.

I.V.5 – Evaluation

This variable has to do with the way of evaluating the effectiveness of the platform and the methods used for measuring the satisfaction level of use by the community. It can be measured by comparing the number of users of the e-Learning platform, or the number of outstanding requests for training in its use.

The following table, Table 1 considers the examples of the relationship between the variables and the issues raised with those responsible for implementing the platforms.

Table 1 – Association between Variables and Questionnaire

Question Number	Variable	Question
1	I.V.1	How long has the platform to support e-Learning existed?
2		What are the objectives pursued with the implementation of the platform to support e-Learning?
3		How were the themes covered in the platform selected?
4		What benchmarking procedures were used in choosing the solution?
5		What organizational changes took place in technology and human resources?
6		What actions have been taken to promote the release of the platform to support e-Learning?
7		What is the community's response to the platform to support e-Learning?
8		Are there partnerships with other institutions?
9	I.V.2	Are financial incentives given to implement the platform to support e-Learning?
10		Are incentives given to the technical team?
11	I.V.3	Are there plans to ensure quality standards?
12		What are the main security measures which have been implemented?
13		Was an analysis carried out to identify the needs of the community?
14		Is there any multidisciplinary team responsible for the platform?
15		Are the materials and procedures reviewed periodically?
16	I.V.4	What forms of interaction with the community are implemented in the platform?
17		Is technical support provided to the community regarding the use of the platform? If so, how?
18	I.V.5	What methods are applied in assessing the effectiveness of the platform?
19		How do you measure the satisfaction of the community regarding the use of the platform?

The analysis of the questionnaire responses showed that the factors deemed most important by those responsible for the platforms to support e-Learning are the "incentives given to the project" and "platform development". These values are meant to represent the presence of the dependent variable "presence and quality of the platforms to support e-learning", not as a quantitative analysis, but as a way to better visualize the importance of their presence. The dependent variable was defined so that the influence of each factor could be analyzed individually and as a whole, in response to the system. The fact that the factor "Support and Interaction" has an average presence, and together with the two factors mentioned above, leads to the conclusion that those responsible are committed to providing good service to users by investing heavily in technological quality, human resources and user interaction.

2.2.3. Actions Taken

Given the need for tools to support e-learning and the main features that those responsible for the platforms indicated as the most important to take in consideration in its implementation and that should be reflected in the development aspects of the platform, called PAPeLI, it will be a great contribution and complement to e-Learning. It will provide a range of services supporting the use of Moodle, but the aim is for it also to be a driver of collaborative work in education and the environment in which it occurs, as well as contributing to development and innovation in distance learning.

The platform consists of the following areas:

- Informative –where information is provided on the e-Learning initiatives of the institution, and about the platform itself, providing support services to all users involved and who use Web 2.0 resources applied to education;
- Online Support - where teachers and students can be helped with various support issues, such as creating accounts, blogs and wikis;
- Library –where documentation is provided to support the use of e-learning platforms, blogs and wikis;
- Collection of convenient thematic data, giving users quick access to pages with information about e-Learning, Web 2.0 and Collaborative Work.

2.2.3.1. Selection of Software Tools

At this point, the research is centered on finding a software under the open source policy, which can satisfy the requirements of a functional portal: reliable, efficient, able to be modified, including both improvements and extensions of functionality as well as repairing faults, with a usable, easy to understand interface, in our native language (Portuguese) and with a good community of users/developers to maintain the extra features available.

Another requirement is that the implementation of this portal may be performed in servers which support free programming languages and most of the communication protocols and database on the market. Therefore, a long list of Content Management Systems (CMSs) that are on the market was researched in order to find the one that best fits the objective of the project.

A demo version of the following CMSs was tested: Zikula, Joomla, Geeklog, Drupal, Mambo, PHP-Nuke, Website Baker, sNews, Pligg, MODx, Xoops, Dolphin, Typo3, Concrete5, phpwcms and e107. Among all of these tools the Joomla was chosen as the CMS to implement the platform to support e-Learning. Joomla has been developed from the Mambo⁴; it is written in PHP and runs in Apache or IIS web servers and MySQL database software. Joomla is in major expansion, is probably in most demand, and has the largest community and available resources. The great advantage of Joomla is its diversity of extensions, add-ons, components, modules and plugins which are free and available in various portals around the Web. This is an open source project (GNU/GPL) and its latest stable version in Portuguese language is the Joomla 1.5., having already gone to version 1.6 beta 13 with the *Release Candidate* available very soon. There are rumours that the production cycles are shorter, so that the release of version 1.7 is expected six months after Joomla stable version 1.6.

2.2.3.2. Web-Site Contents – PAPeLI

Publications in e-Learning

The most important publications in the area of e-learning and collaborative work were analyzed, as well as books and articles that are available on the portal as a ready reference.

Library

This section is the most important included in the PAPeLI portal. This is a database with manuals, video tutorials and other files of interest as well as access to free software that will allow users to get help quickly

⁴**Mambo** is an award-winning content management system (CMS), which can be used for everything from simple websites to complex corporate applications.

in the use of Moodle. Nineteen video tutorials were conducted in support of the Moodle site and made available on PAPeLI, for the consultation of users

Promotion of Events and Training

As with other platforms to support e-Learning, the portal aims to promote events and training in the area of e-Learning. Thus, through the portal, users can have access to this information.

Information, FAQs and Forum

PAPeLI also features a news section on e-Learning and the latest highlights can be found on the home page of the portal. All documents must be consulted via the link "News" available on the main menu. The user can also find at the top of the page direct access to News Feeds, where the latest articles and information from reference sites about e-learning and other topics are uploaded. While using the portal, the user can use the Frequently Asked Questions (FAQs) section and find quick access to answers to questions from other users. These can be accessed via the menu that is at the top of the portal. If the user prefers, there is also a forum accessible via the same menu with the link "Community", where their issues about e-Learning can be discussed and promoted..

2.2.4. Evaluation

With the platform in operation, indicators began to emerge that point to the real need for the portal PAPeLI in the School of Technology and Management of the Polytechnic Institute of Viana do Castelo. It was found that much of the community made a large number of requests for the opening of several wikis to develop work to support their courses. Examples of these are two blogs created to promote the course of Computer Engineering (blog@eicandidato and blog@eialuno) among students and prospective students, which emerged as a result of PAPeLI, and others followed. Another focus is the success of Moodle training, conducted within the institution and aimed at the teachers regarding the use of some features of the application, and that also came up because of the portal PAPeLI. The acceptance of this platform was measured using questionnaires developed in the LimeSurvey tool with direct access available to users in the institution's Moodle. Positive responses about the excellent resources available on the portal were collected. PAPeLI is certainly an asset to the support of e-learning and has come to fill the perceived need of support for the use of Moodle, and Web 2.0 services and tools.

2.2.5. Learning

It can be verified that the presence of a portal to support e-learning platforms, courses and collaborative and social tools is considered essential. The choice of technology for the development of these portals does not seem to be of any concern, often because of the fact that the best practices have been adopted. It seems that there are major changes in terms of human resources, especially the recruitment of specialized staff, and technological concerns with issues such as integration into existing systems. There is also an awareness of the dissemination of the application and its functionalities within the community and a gradual adaptation of the technology with users is also mentioned. Of note is the existence of partnerships in developing these projects which will solidify the presence of incentives given to the project and its professional staff, which certainly regard with pleasure the support of those responsible for the implementation of such solutions. As such initiatives require significant investment and returns are not always guaranteed in the short term, a possible lack of such returns may be one of the reasons why some HEIs have not yet implemented these support platforms.

Another important point is the concern over integrating these platforms with existing information systems where in issues such as security this aspect is seen as being assured, although the fundamental aspect that stands out relates to the authentication of users. PAPeLI was based on this study and took into consideration the concern with issues of quality of service. In the hope that it will be supported by a specialized multidisciplinary team, it already has a range of forms of contact with users and does not ignore the evaluation process carried out by means of questionnaires, mentioned above. The users of PAPeLI can

access the data library and search for the help they need through the manuals available, which are organized by sections and categories that facilitate their location.

3. Conclusion And Future Work

The demand for distance education has grown rapidly with e-learning as a dynamic process offering new possibilities and innovative, pioneering teaching that uses a variety of content and working methods. Today, communities seek content and materials prepared with quality and aimed at self-learning in various formats. However, they need to be aware that the implementation of these systems at an institutional level encompasses a number of challenges which must be able to respond effectively, such as the technological infrastructure, technical support in the maintenance and management of systems, training and professional recognition, in the hope that the whole community will participate in this practice. Motivated by the new generation of e-learning, our aim was to determine the importance of the implementation of a support portal such as PAPeLI in the use of an e-learning platform and Web 2.0 tools, using as a point of comparison the best practices already adopted by other institutions with a lesser or greater degree of maturity and that somehow underpin the need for such applications.

Thus, this article presents the methodology of action-research used to guide us in developing this project in order to ensure the implementation of a platform of support for e-Learning in the School of Technology and Management of the Polytechnic Institute of Viana do Castelo, presenting the Portal and concluding with the evaluation of the degree of user satisfaction with regard to this platform. It was concluded that the Portal made a very positive contribution to the development of e-learning in our Institute.

As a continuation of this work, we have been pointed in a number of directions, both in order to improve and extend it, as well as to address some limitations. Therefore, we propose improving the processes and content, going against the best practices recommended by experts, as well as the mechanisms of evaluation in accordance with international standards. Secondly, we intend to study the factors that have led to poor implementation of platforms to support e-Learning in Higher Education Institutions, as well as the way in which these platforms can bring competitive advantage to those institutions.

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